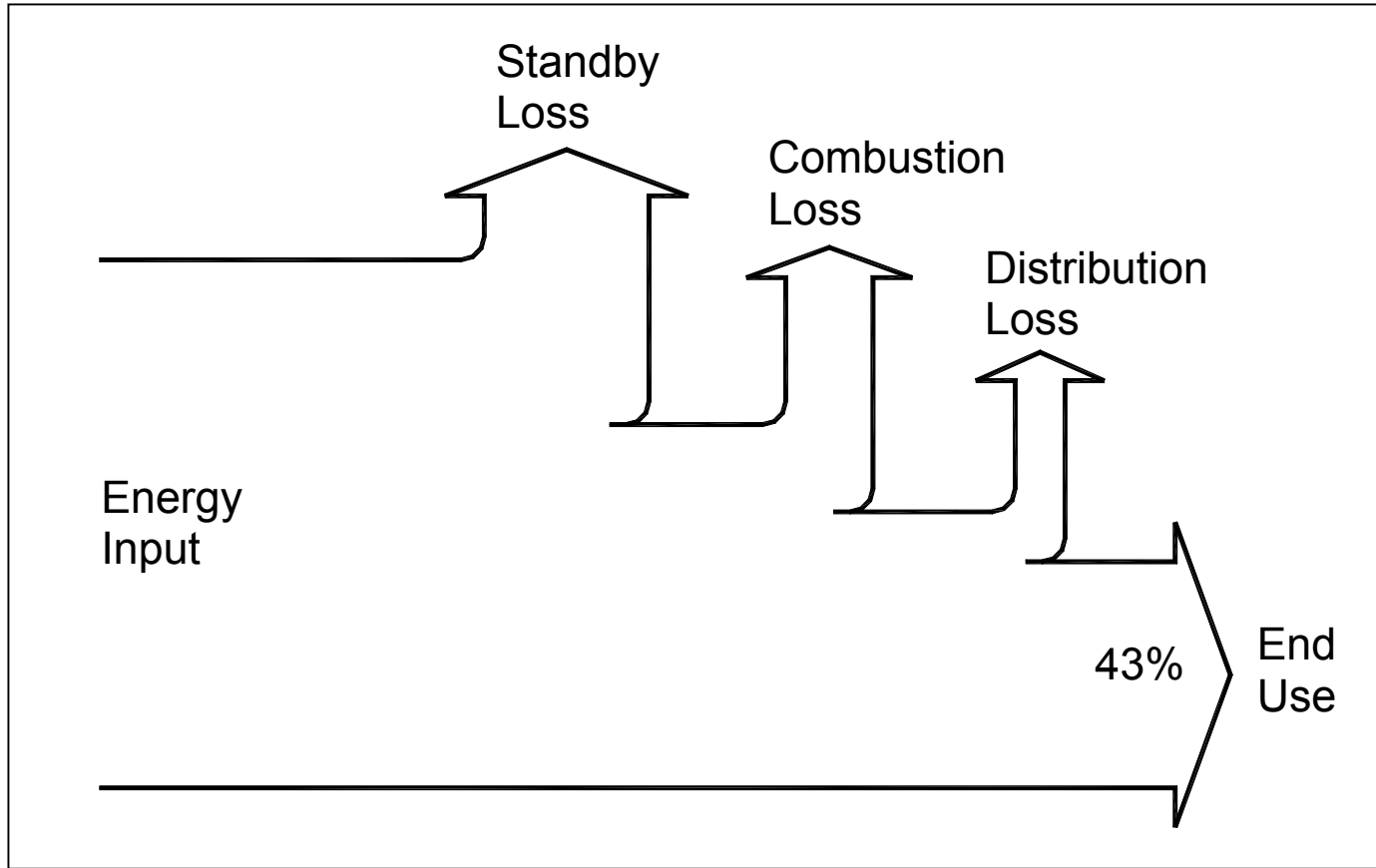


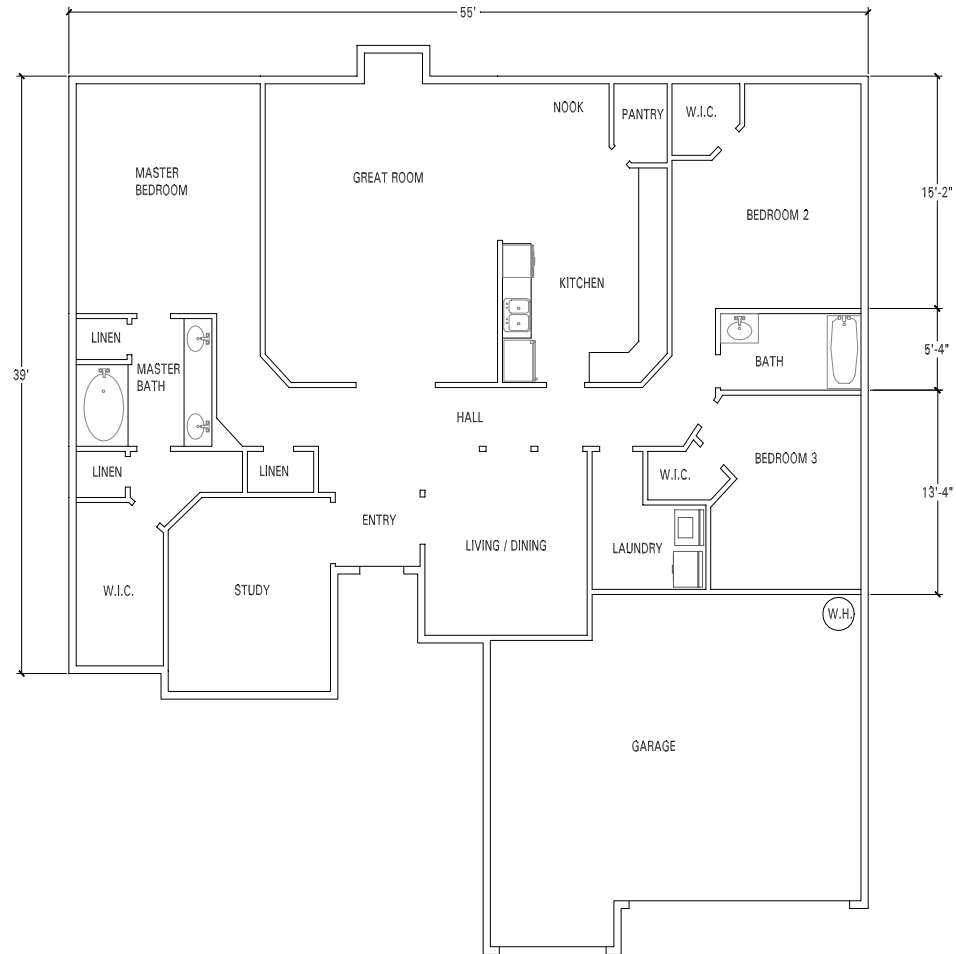
Water Heater Losses



Analysis Methodology

- HWSIM used to model standard piping layouts, parallel piping, and pipe insulation
- Assumptions consistent with 1991 study
- Process:
 - Select prototype houses (960 - 3080 ft²)
 - Lay out systems (pipe sizing, lengths)
 - Build up fixture loads (to meet recovery load target)
 - Evaluate performance

Prototypes



Residential Draw s

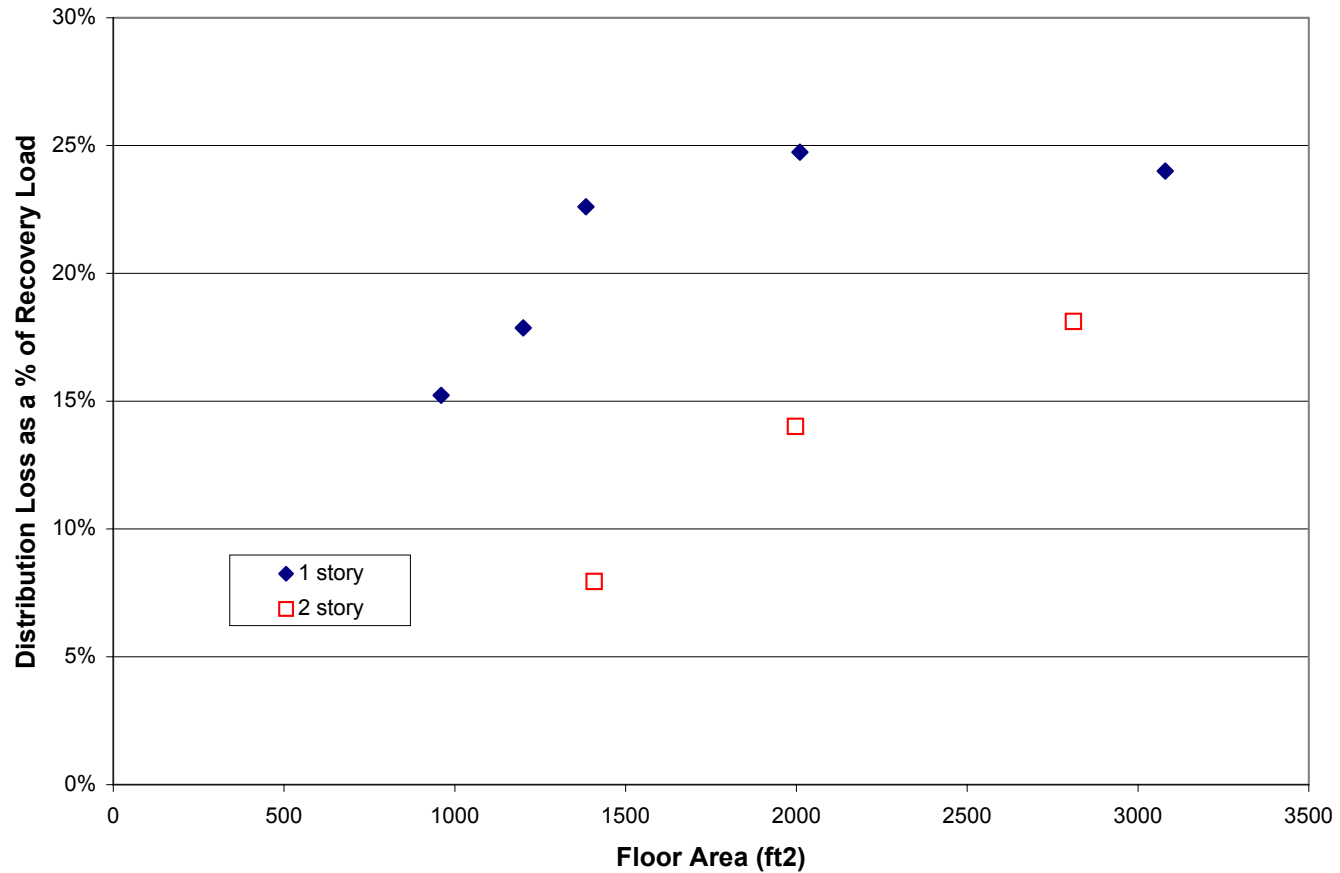
Table 1: Summary of DHW Use Quantities

Use Point	Volume (gals)	Assumed Use Temperature (°F)	Gallons of 135°F Water per draw
Kitchen— 1 gal draw	1.0	105	0.57
Kitchen— 3 gal draw	3.0	105	1.71
Lavatory	0.7	105	0.40
Shower— 10 gal	10.0	105	5.71
Shower— 20 gal	20.0	105	11.43
Dishwasher	10.8	135	10.80
Clothes washer*	9.1	135	9.10
Regular bath	35.0	105	20.00
Whirlpool bath	50.0	105	28.57

* assumes a mix of hot/warm/cold cycles; based on 20% horizontal axis penetration

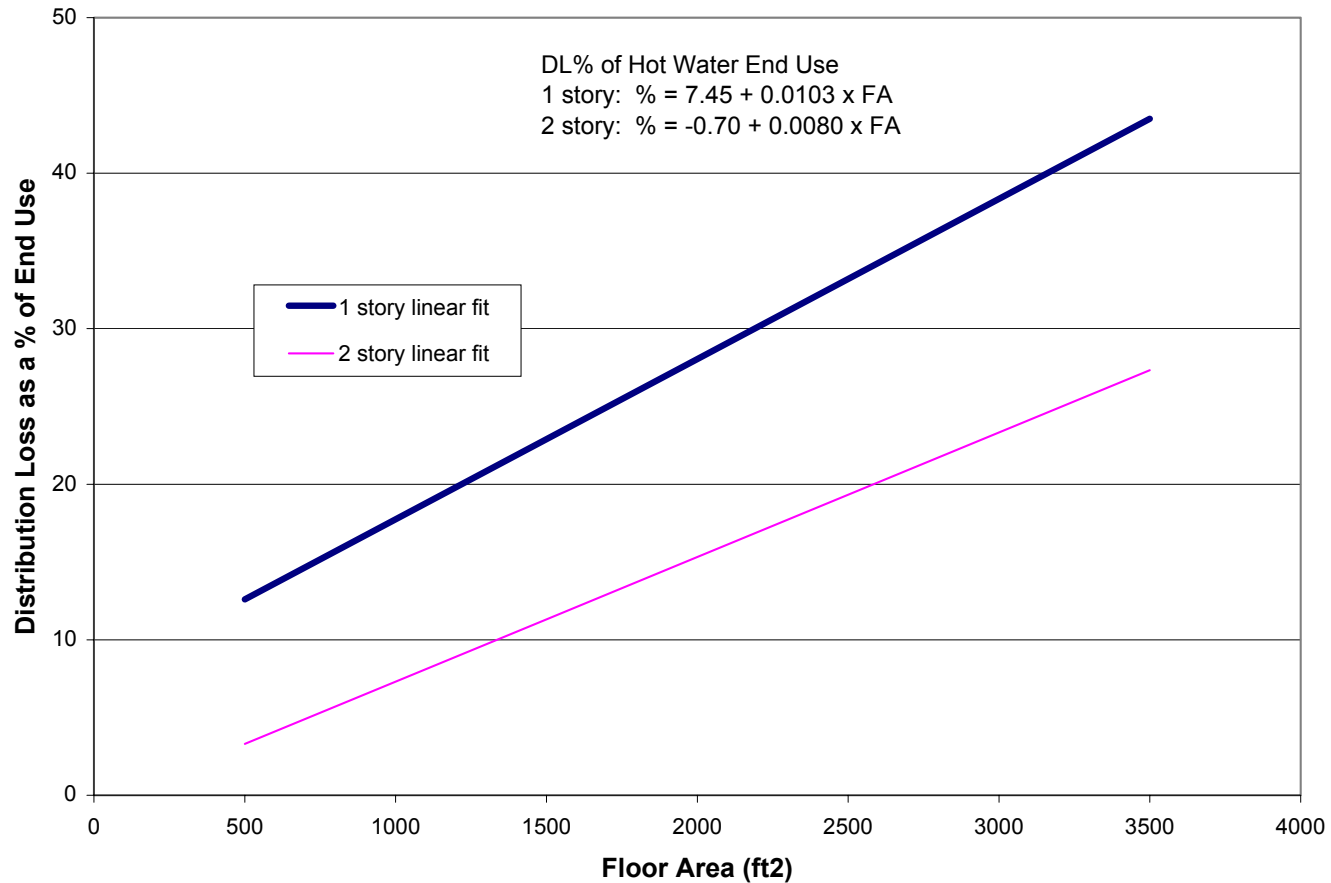
HW SIM Results

Figure 1: HWSIM Results Summary



Recommended Base Distribution Losses

Figure 2: Proposed DL Relationship to Floor Area



SDLM >> to be calculated for all systems
based on floor area & number of stories

Table 2: Proposed Standard Distribution Loss Multipliers

Distribution System Type	Single Family SDLM*
“Standard” one-story	1.18 – 1.33
“Standard” two-story	1.07 – 1.19
Point of Use (POU)	1.00

* range shown for floor areas of 1,000 and 2,500 ft²

Recirculation Systems

- External Calculations
- Use 3,080 prototype with actual recirculation system layout
- Concentric pipe heat loss calculation
- Evaluate:
 - Continuous recirculation
 - Timer only and temperature only controls
 - Combined timer/temperature
 - Demand control

DSM >> modifies Standard distribution loss

Table 3: Proposed Distribution System Multipliers

Distribution System Measure	Single Family DSM
Pipe Insulation (all lines)	0.79
Pipe Insulation (kitchen lines)	Mandatory Measure
Parallel Piping	0.88
Recirculation (no control)	Not allowed
Recirc + timer control	2.54
Recirc + temperature control	3.14
Recirc + timer/temperature	2.09
Recirc + demand control	1.10

Calculation Procedures

$$\text{Distribution Loss Multiplier (DLM)} = 1.0 + ((\text{SDLM} - 1) \times \text{DSM})$$

$$\text{Adjusted Recovery Load} = \text{SEU} \times \text{DLM} \times \text{Solar Savings Multiplier}$$